COMMONWEALTH OF PENNSYLVANIA.

DEPARTMENT OF AGRICULTURE.

BULLETIN No. 47.

SOME INSECTS ATTACKING FRUIT AND FRUIT-TREES.

By H. T. FERNALD, Ph. D.,
State Zoologist.

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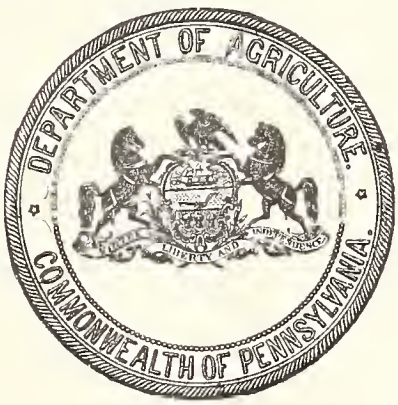

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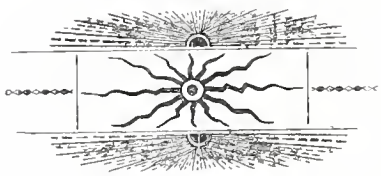
COMMONWEALTH OF PENNSYLVANIA,
DEPARTMENT OF AGRICULTURE,
DIVISION OF ZOOLOGY,
HARRISBURG, *May 1, 1899.*

HON. JOHN HAMILTON, *Secretary of Agriculture:*

Sir: I have the honor to offer for publication the following paper on Some Insects Attacking Fruit and Fruit Trees, as one of the Bulletins of the Department. Much of the present enormous loss to fruit growers in Pennsylvania, caused by the attacks of insects can be avoided by using the proper means, with the result of saving several millions of dollars each year. The best methods to use in preventing these losses have been laid stress on in this paper in the hope that they may be made use of by the fruit growers of this Commonwealth.

Respectfully submitted,

H. T. FERNALD,
Economic Zoologist.



SOME INSECTS ATTACKING FRUIT AND FRUIT-TREES.

Fruit raising in Pennsylvania has for some reason been neglected and in consequence is an occupation of but small importance as compared with what it might easily be made. The census of 1890 shows that fewer bushels of apples were raised in Pennsylvania than there were bearing trees, while the yield should average several times this. Moreover, the fruit which is obtained is, much of it, so injured by the attacks of insects and fungi as to greatly reduce its value, while quite a portion of that which at first forms is so quickly affected by one or another of these causes, as to soon drop off and be an entire loss.

The fruit tree, to pay, needs as much care as any other plant, and the person who starts an orchard and expects to reap any benefit from it without further care is sure to be disappointed.

Fruit trees are particularly liable to the attacks of insects, more than two hundred and fifty different kinds feeding on the apple alone. Fortunately most of these are seldom present in destructive abundance, and most can easily be coped with.

THE CODLING MOTH.

(*Carpocapsa pomonella* Linn.)

This insect, often called the apple worm, does an enormous amount of damage each year in Pennsylvania. This loss may be divided into two parts. Many apples are infested when they first form in the spring, and are so injured that they soon drop off. Of those which remain, it is safe to say that a large proportion are so wormy as to be unsalable, and perfect apples form less than half the number which are finally gathered.

Just how much Pennsylvania loses in this way cannot be estimated, but comparison with her northern neighbor, New York, may be of interest. In the latter State the average apple crop is estimated at 5,000,000 barrels, which at $1.50 a barrel, would be worth $7,500,000. It is also estimated that wormy apples form one-third of the crop, making the loss to that state each year $2,500,000.

Life History.

The insect which causes wormy apples is a little moth in its adult state, measuring about three-quarters of an inch from tip to tip

of its outstretched wings. It appears in early spring about the time the blossoms fall and the little apples begin to form. It lays its eggs either on the little apples, on the stem, or even on leaves close by, and usually not more than one or two at the same place. The moth lays from fifty to one hundred eggs in all; then dies. The young caterpillar hatches from the egg in about a week and wanders about for a short time, but soon finds its way to the calyx of the apple, at the point opposite the stem—"blossom end"—and works its way in between the calyx lobes which by this time have drawn together, leaving a little space within. Here it probably feeds for a day or two before beginning to eat its way in towards the core, where it feeds for from twenty to thirty days. During this time it grows

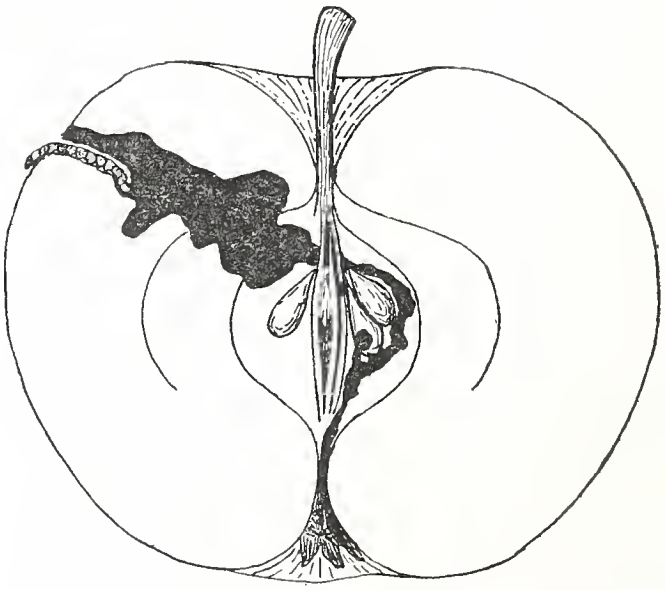


Fig. 11.—Apple, cut to show work of Codling Moth, with caterpillar leaving, at the side. Natural size.

to full size, and just before this has been reached it eats a hole to the outside, usually in the side of the fruit. After feeding a few days longer the caterpillar is ready to leave the apple and it passes out through the hole it has cut, pushing out the excrement which has thus far more or less completely filled up the hole. It then seeks some protected place in which to spin a cocoon around itself within which to pass through the changes necessary to change the caterpillar into the moth. If the apple it leaves be still on the tree, this protected place is very often under some loose piece of bark on the trunk, but if the apple has fallen, it seeks any shelter it may find, under the protection of which it undergoes these changes. Usually this change occurs during or after July, and the change to the adult moth may be completed in two or three weeks, or it may be delayed till the following spring. In the former case the moths appear in

August and lay their eggs for a second brood. The caterpillars of this brood work in the same way as those of the preceding one, but fewer of them enter the apple at the blossom end, entering instead on the side, and often feeding for a short time just beneath the skin of the fruit and producing large wormy spots which greatly disfigure it. After feeding till full grown the caterpillar leaves the apple and forms a cocoon in which to pass the winter, often after the apples have been gathered.

From this outline of the life history it is seen that there may be one or two broods a year. As a rule the more northern localities have but one brood while southern ones have both. In Pennsylvania it is probable that some which form cocoons in July remain in that condition over winter, while others emerge in August and in this way form a partial second brood.

Treatment.

Spraying at the proper time and in the right way is very successful for the control of the codling moth, but if it is done at the wrong time does little good. After the blossoms fall, the blossom end of the little apple which at this time is just forming, bears five small leaves arranged in a circle, and which, while the flower was in bloom formed the calyx. As the apple grows, these become shriveled up and in the ripe apple form the blackish material of the blossom end. At this time, however, they are quite large and for a short time stand apart and form the wall of a little cup. This end of the apple is pointing upward and only turns down later when the increase in weight of the apple causes its stem to bend. If the tree be sprayed with Paris green soon after the blossoms fall, and while these five calyx leaves yet stand apart, the poison will fall into and be held in this little cup, and when the walls draw together and close, the cup will still hold the poison. After the calyx leaves have closed it is too late to spray as no poison can then get into the cup. Although this be true of the poison, it does not hold for the insect, however, which, as already stated, works its way in between the calyx lobes where it feeds for a time, and if the poison be already there, the result is all that can be desired.

This treatment will probably destroy three-quarters of the first brood, but those which escape should be destroyed in another way. As already stated, when full grown, the caterpillar leaves the apple and seeks for some protected place in which to spin its cocoon. If it can be induced to do this where it can subsequently be found and destroyed, much will be gained. To accomplish this, it is well to scrape off all pieces of loose bark from the trunk and larger limbs, and then put a band of cloth or even newspaper in several thicknesses loosely around the upper part of the trunk to provide a place

under which the caterpillars may spin up and where they may subsequently be destroyed. This band should be put on about the last of June and examined two or three times during July, and all cocoons found under it destroyed. The success of this plan may be see from the fact that in a single case, under one such band, forty-two cocoons were found and killed during July, 1898.

This method will destroy most of the caterpillars which leave the fruit while it remains on the tree. To destroy those which fall to the ground with the fruit they are in, letting poultry and hogs run in the orchard is usually sufficient, although picking up the windfalls and feeding them to stock is also advisable.

In this connection it should be remembered that the codling moth also attacks pears, and the same treatment for these is advisable, with this fact kept in mind—that the calyx lobes on pears do not draw together, and accordingly, though poison may easily be placed in the cup as in the case of apples, it is not held there but is washed out by the rains, and the spraying must be repeated once or twice, particularly if rain falls abundantly during this time, if satisfactory results are to be obtained.

By following these methods at least three-fourths of the fruit now lost by the ravages of the codling moth can be saved, and at a very small cost of time and money.

THE APPLE TREE TENT CATERPILLAR.

(*Clisiocampa americana* Harris.)

This insect, though familiar everywhere in Pennsylvania, is not usually so abundant as to cause serious loss, although in adjoining states it is often a great nuisance. It not only feeds on the apple, but also on the peach, cherry, plum, wild cherry and other trees, and is easily recognized by the white silken tents formed in the smaller crotches of the trees, by the caterpillars. These are formed in the spring, however, and can therefore be easily distinguished from those formed by the web-worms, which appear in July and August, at a time when the tents of the tent caterpillars have entirely disappeared.

Life History.

This insect passes the winter in the egg. In the spring about the time the leaves appear, the eggs hatch, and the little caterpillars select some fork in which to begin their tents, and from which they spread in all directions to feed, returning to the tent at night, and often, also between morning and afternoon excursions for food.

As they become larger they enlarge the tent until it is a very noticeable object, and wherever they go they spin a thread, as though

for the purpose of providing a guide for them to follow back to the tent by. In this way they feed and grow for five or six weeks, at the end of which time they are nearly two inches long.

About the middle of June, or perhaps a little earlier, the caterpillars cease feeding, leave the web, and seek for a place in which to spin their cocoons. Within the cocoon the caterpillar transforms

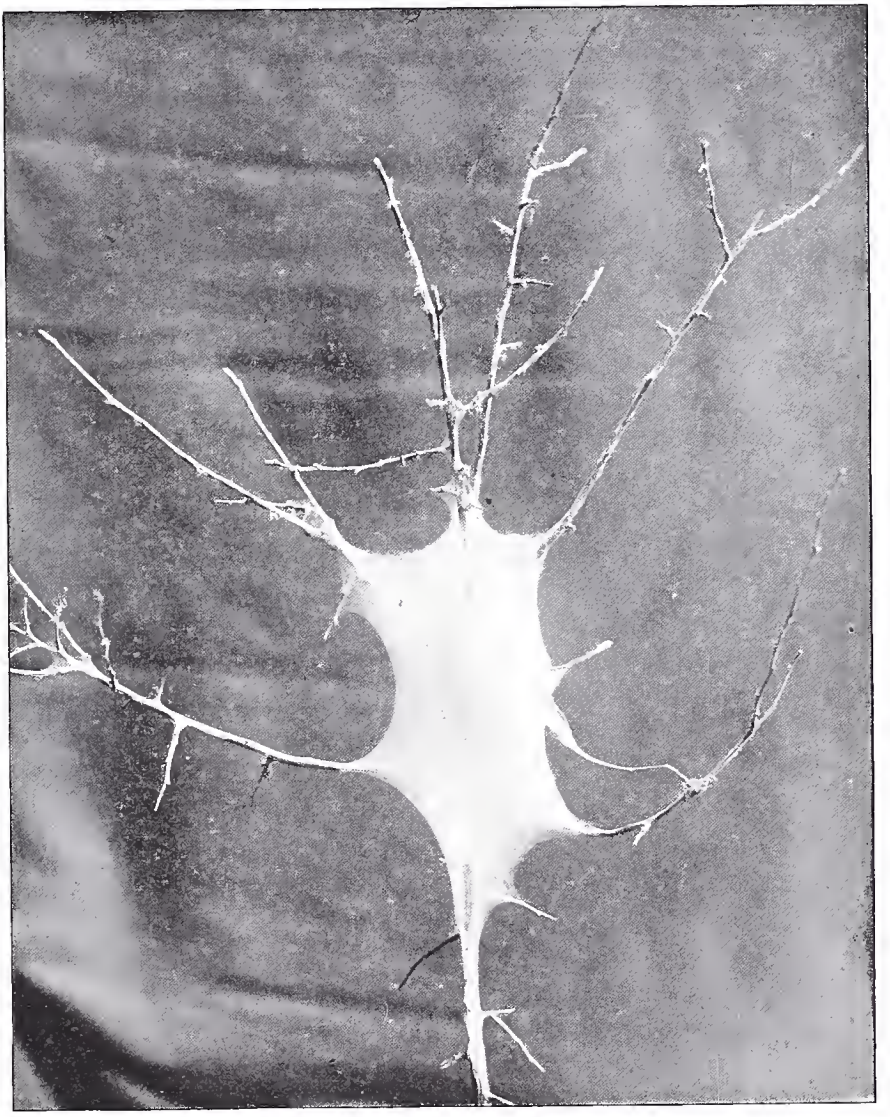


Fig. 12.—Tent of Apple-tree Tent Caterpillar. On the lower branch at the right is the egg mass from which the caterpillars hatched.

into the adult moth, a process which takes from two to three weeks, after which the moths appear.

The eggs are now laid on the twig of a tree, in a broad band entirely around the twig, each band containing two or three hundred eggs. At the edges of the band, it tapers down close to the twig, by which the egg mass may be distinguished from similar egg masses

laid by certain other insects. The eggs remain in this condition during the remainder of the year and hatch the following spring.

Injury.

The injury caused by this insect is to the leaves, and as a full grown caterpillar will consume two leaves a day, a nest of them will destroy five hundred, or over, each day. The effect of this upon the tree, when the tents are abundant, is quite serious, the energies of the tree, instead of being directed towards maturing the fruit, being devoted to the production of new leaves to replace those it has lost.

A few years ago the Apple-tree Tent Caterpillar was so abundant in various parts of Massachusetts that it stripped all the leaves from trees and shrubs over a large area. In order to check this devastation one or two Horticultural and Improvement Societies in the infested district offered prizes for the largest collections of egg masses brought in for destruction and in this way obtained and destroyed masses calculated to represent 25,000,000 eggs. So successful was the work, that the societies renewed their prizes for the following year, offering $1.00 for every thousand masses brought in, and in consequence so reduced the insects that thereafter little trouble was caused.

Treatment.

The apple tree tent caterpillar is fortunately not a difficult insect to deal with. Its tents are easily seen, and the habit the caterpillars have of returning to them at night renders it a simple matter to destroy them all while gathered together, by the use of a torch at night, or before eight o'clock in the morning. The method mentioned above of gathering and destroying the egg masses is also an excellent one, and should be made use of during the winter months, when the trees are bare, and the egg masses may be more easily seen. Spraying the tree, particularly in the neighborhood of the nests, with Paris green, is also effective. Several parasites prey upon this insect and aid in keeping it in check, and if it appears in injurious numbers at any time, it may be considered solely as the result of neglect.

THE CECROPIA EMPEROR MOTH.

(*Platysamia cecropia* Linn.)

This handsome insect is the largest moth which is found native in this part of the country. It is seldom seen, however, as it flies only at night, remaining concealed in the daytime.

Fig. 13.—The Cecropia Emperor Moth.

Life History.

It appears in May or June and lays its eggs to the number of two or three hundred, usually in pairs, on the under side of leaves of the trees the caterpillars are to feed on. As a general rule but few are laid on the same tree. After a week or ten days, the little caterpillars hatch and begin to feed, beginning with the now empty egg-shells. Then they attack the leaves, and though at first very small, feed voraciously and in consequence, grow rapidly, till at the end of five or six weeks they are from three to four inches long, and as large around as a man's thumb. They are light green in color, with large red and yellow humps along the back and smaller blue ones on the sides. When the caterpillars are full grown they stop feeding and proceed to spin a cocoon within which to pass the winter. This is usually attached to some small branch of the tree, and is several inches long, brown in color, and unless carefully noticed, looks like a swelling of the branch. Here the insect passes the winter and changes from the caterpillar into the adult moth which escapes from the cocoon the following spring.

Injuries.

This insect is serious, not because of its abundance, but because of the large size attained by the caterpillar. When two or three are feeding on a small tree it is not at all unusual for them to strip the entire tree of its leaves, and this loss during the growing season not only checks the growth of the tree but often causes it to die. It feeds, not only on the apple, but also on the pear, plum, cherry, maple, willow, red currant, hickory, elm, honey locust, and other plants.

Treatment.

The Cecropia caterpillar is so large, as it approaches its full size, that it is usually easily found, either by observing where the leaves are being stripped off, and searching near, or by noticing the black excrement which may be found on the ground beneath the tree, and searching above the spot. When the caterpillars are once found, gathering and killing them is usually the quickest and easiest method of checking their attacks. In case this cannot be done, for any reason, spraying with Paris green should prove successful.

Birds and insect parasites freely attack this insect and aid greatly in keeping it under control.

THE ROUND-HEADED APPLE-TREE BORER.

(*Saperda candida* Fabr.)

This insect is quite generally distributed over the entire apple growing portion of the United States, and gives the fruit grower much trouble. Its injuries being entirely inside the trunk, makes it a difficult insect to combat, and as a consequence of its work, many trees are either seriously crippled or entirely lost. Unlike the flat-headed apple-tree borer, which is equally common, it works in the trunk for a long time before completing its life history, and the effect of the presence of even a single individual is considerable.

Life History.

The adult beetle, which is about three-quarters of an inch long, of a grayish color, with two white stripes along its back, lays its eggs during June, July and August in little slits in the bark made

Fig. 14.—Round-headed Apple-tree Borer. A, Adult beetle; B, full-grown grub. Both enlarged.

for the purpose by the beetle on the trunk of the tree, usually close to the ground. The eggs hatch in a week or two, and the little grubs gnaw their way inward where they feed on the sap wood and inner bark, making flat, shallow cavities, often so near the surface that the bark over them cracks and some of the "sawdust" falls out. As winter approaches they work downward and after a short time become quiet till the following spring. They then work upward, and continue feeding on the sap wood doing much damage, as they are now large enough to consume considerable quantities.

When winter comes again the grubs become quiet, as they had done the winter before, and the following spring begin their last work in the tree. They now eat holes in different directions, usually going deeper into the trunk, but late in the summer bore up and out to the bark,after which they turn back and become quiet, while changing from the grub into the beetle. The following spring this change has been completed, and the beetles gnaw their way out through the

thin layer of bark left over the holes, and proceed to lay their eggs for another generation.

Three years are required to complete this life history, as the above outline shows. Eggs laid in July, 1897, for example, will produce the adult beetle in June or July, 1900.

Injuries.

This borer feeds on the apple, pear, quince, mountain ash, June berry, thorn, English hawthorn, etc. In some places it is very common, there often being several grubs in a single tree. It is one of the most serious enemies to the apple and pear grower, as its habits render it difficult to destroy.

Treatment.

Here, as in most cases, there are two main lines of treatment—prevention and cure—and both will need to be made use of, as neither alone is entirely successful.

Prevention is directed entirely to keeping the insect from laying its eggs on the tree, and various methods of accomplishing this have proved partially successful.

As the beetle prefers to lay its eggs on the trunk, close to the ground, it has been suggested to remove a little of the earth at the base of the tree about the 10th of May and wrap three or four thicknesses of newspaper closely around the trunk for a least a foot and a half above the ground, pushing the paper tightly in, so that the insect cannot get between the paper and the trunk. The paper should be tied with a string, and the earth removed, should now be returned and pressed tightly down against the lower part of the paper. This wrap, if properly put on, should last till winter, and can be renewed the next spring.

Another method of prevention is to take fine wire netting, cut in four sided pieces, the tops being considerably shorter than the bottoms. These pieces can be fastened by the sides, till enough are thus connected to go around a tree-trunk, at the base of which the netting will stand, sloping out and down, from where it touches the trunk, to the ground like a funnel, bottom up, with the tree coming up through the middle. The netting should be cut tall enough so that it should reach up eighteen inches to two feet on the tree, where it should tightly fit. At the lower edge the earth should be pressed down over it, so that the beetle cannot get inside the netting and get at the trunk.

These methods are both quite effective, but as the beetle often lays its eggs quite high up, other steps must be taken in addition. To protect the higher parts of the tree, whitewashing the trunk and

larger limbs, adding Paris green enough to give a little color to the whitewash, is a good plan, and though some persons object to this, claiming that it is not good for the tree, it is certainly better than borers.

When borers are already in the tree, remedies are called for. The best known remedy under these circumstances, is cutting out the grubs. Little heaps of sawdust, or dead and discolored portions of bark generally indicate where to cut, and if instead of shallow cavities close to the outside, cylindrical holes are found, a wire soft enough to follow the turns of the hole and pierce the grub, will work better than a knife.

THE PEACH TREE BORER.

(*Sannina exitiosa* Say.)

The peach tree borer is probably one of the worst insects Pennsylvania peach growers have to contend with. It attacks the young

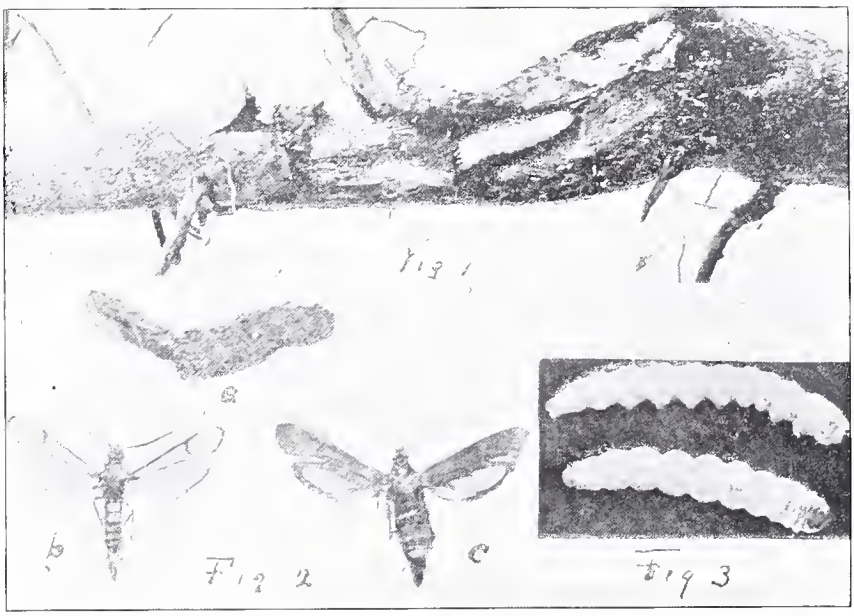


Fig. 15.—Peach Tree Borer. 1, Plum root showing work of borer; 2 a, pupa case; b, male moth; c, female moth; 3, two grubs somewhat enlarged. (From *Sirrine.*)

trees, often entirely girdling them. The adult insect, unlike the round-headed apple tree borer, is a pretty little moth, but the habits of the two insects, during the stage when they are in the trees, are very similar, and the treatment for the two is accordingly much the same. It occurs all over the United States where peaches are grown.

Life History.

The adult moths appear in Pennsylvania in June and lay their eggs on the bark of the peach tree, usually close to the ground,

though in some cases they may be placed as high as the crotches of the larger branches. The grub which hatches from the egg works its way into the bark and to the sap wood where it feeds till well into the fall. Its gnawing causes the tree to pour out gum mixed with the excrement of the grub, and the appearance of this gum is usually the first evidence of the presence of the borer. As winter comes on the grub becomes quiet, but begins to feed again the following spring, and has reached its full size (about an inch long) by June. It then transforms into the adult moth, the change requiring but a short time, and leaves the tree, to lay eggs for a new generation.

Treatment.

As with the apple-tree borer, treatment is of two kinds—prevention and remedy. To prevent the insect from laying its eggs, wrapping the trunk as described for the apple-tree borer, has given good results. Mounding up the earth around the trunk to the height of a foot or more has also proved quite effective though it has been claimed that this method renders the bark tender. It should be done about the first of June and either left there and added to somewhat each year, or, if removed, this should not be done before the last of August.

Various washes have also been used with good results. One of these is made by mixing two quarts of strong soft soap and a half a pint of crude carbolic acid with two ounces of Paris green; adding a bucketful of water, and lime and clay enough to make the whole into a thin paste, and applied to the tree.

Perhaps a more effective wash is prepared by taking whitewash made from fresh-slaked lime and adding a little glue, and a tablespoonful of Paris green to each bucketful. This should be applied to the entire trunk, from the larger limbs down to below the level of the ground three or four inches of which should be removed while the whitewashing is being done.

As a remedy, where borers are already in the tree, locating their position by the masses of gum and cutting them out is the best treatment known.

THE PEACH TWIG BORER.

(*Anarsia lineatella* Zell.)

This little moth appears to be quite abundant in Pennsylvania, as I have found it in every peach orchard examined. Its work seems to have been almost unnoticed, however, and in each case, on attention being called to it, the grower stated that he had not noticed its presence before. It occurs in nearly all the peach growing sections of the country and is responsible for much injury to the trees. On

the Pacific coast it is also injurious to the apricot, almond, pear, prune and other trees, and in California is regarded as one of the worst enemies the peach grower has to contend with, and is probably responsible for far more destruction in this State than is generally supposed.

It was formerly supposed to be the same insect as the strawberry crown-miner, and that it was entirely distinct from the latter was not discovered until 1897. The advice formerly given, to avoid raising strawberries near peach orchards, was due to this error, and need not be followed.

Life History.

There are at least three broods of this insect each year. The little caterpillars are found in the late fall, living in the spongy bark, chiefly in the smaller crotches of the tree. Here they pass the winter, and the cavities they excavate and in which they hide are marked by little masses of bark and excrement combined, which project at the entrance to the cavities. In the spring the caterpillars leave these hiding places and pass to the leaf-shoots where they work in along the stem a varying distance, eating the substance of the shoot, and causing most of the leaves arising from it to wilt and die. The caterpillars travel from one shoot to another, and one caterpillar may in this way destroy several shoots before becoming full grown. When this condition is reached the caterpillar forms a scanty web in the leaves and rubbish about the tree, in the withered leaves on the tree itself, or even lies exposed on the twigs or bark. Here it transforms into the adult moth, the change requiring from seven to ten days, after which the eggs for the next brood are deposited. The caterpillars of this brood attack new growth of the tree, entering the little twigs at the places where these are joined by the leaves, and sometimes enter the stems of the young fruit. Later they travel about and may bore into the fruit itself, near the stem. The adults which come from this brood of caterpillars probably repeat this history, and those of the next brood are supposed to lay their eggs in the crotches of the trees where the little caterpillars pass the winter, although this is not certainly known.

Injuries.

The first brood—the one which passes the winter in the crotches of the limbs—is responsible for the greater portion of the destruction caused by this insect. Boring into the young shoots in the spring and passing from one shoot to another, the twigs are killed, preventing the development of the branches. Thus much of the new growth is destroyed, sometimes hardly an untouched shoot being left. This

not only causes a great loss of vigor and fruiting power to the tree, but causes it to become scraggy and irregular in its growth. On one two-year old peach tree examined in May, 1898, ninety-three injured shoots were found, while in another, one hundred and sixteen had been burrowed in.

Treatment.

Picking off the wilted shoots and burning them has been generally recommended as the best treatment for this insect, but it fails to save the shoots, and in many cases these are unoccupied, the caterpillar having completed its work and gone elsewhere.

The recent discovery of the way in which the winter is passed has given a more successful method of treatment than that of hand picking, which in a large orchard is tedious and only partly successful. It is to spray the tree during the winter with kerosene emulsion or some other preparation which will enter the little cavities in the crotches where the caterpillars are and destroy them.

The particular emulsion recommended for this purpose by the Entomological Division of the U. S. Department of Agriculture, is prepared as follows:

Kerosene,	2 gals.
Whale-oil soap,	½ lb.
Water,	1 gal.

"The soap, first finely divided, is dissolved in the water by boiling and immediately added boiling hot, away from the fire, to the kerosene. The whole mixture is then agitated violently while hot by being pumped back upon itself with a force pump and direct discharge nozzle, throwing a strong stream, preferably one-eighth inch in diameter. After from three to five minutes' pumping the emulsion should be perfect and the mixture will have increased from one-third to one-half in bulk and assumed the consistency of cream. Well made, the emulsion will keep indefinitely, and should be diluted only as wanted for use." To use it during the winter, add six gallons of water to every gallon of emulsion, or in that proportion. If hard water is used, either in making the emulsion or in diluting it afterwards, about twenty-five per cent. more soap should be added. Do not spray long enough to let the emulsion run down the trunk and collect in little pools in the crotches as this would be likely to injure the tree.

By the use of this method it is probable that except under the most unusual circumstances the peach twig-borer may be successfully controlled.

THE PLUM CURCULIO.

(*Conotrachelus nenuphar* Herbst.)

This well known pest is each year responsible for the destruction of a large portion of the plums raised in the State. During 1898 it destroyed about sixty per cent. of the plums formed on the trees, and in the past has been so injurious that many persons have given up raising this fruit entirely.

Life History.

The adult curculio is a little beetle, rather less than a quarter of an inch long and with a snout on its head. It passes the winter in any protected place it can find, and appears in the spring about the time when the buds of the plum trees begin to open and the leaves appear. Until the plums have begun to form it waits about, feeding on the tender leaves, but when the blossoms fall and the plums begin to grow it proceeds to lay its eggs. To do this it makes a little hole in the side of the plum with its snout, and in the bottom of this deposits an egg. As the plum at this time is very hard and is growing rapidly, the egg would be crushed if nothing further were done. To prevent this the insect proceeds to cut a small crescent-shaped slit part way around the hole in which the egg has been laid, in order that the flesh between the slit and the hole may wilt and become soft, thus saving the egg from being crushed. Having done this, the process is repeated in other plums, each female curculio laying from fifty to one hundred eggs.

The eggs thus laid usually hatch in a few days and each little grub thus produced eats in to and around the pit or stone. Usually the slit and hole on the surface pour out a gummy substance which marks where the plum was "stung."

Around the stone the grub feeds and grows until it has reached its full size, which usually requires about three weeks. During this time the plum may have fallen off, the plums which are attacked in this way being very liable to fall early. Whether the plum be still on the tree, or on the ground, however, the grub now leaves it and works its way into the ground where it becomes a quiet pupa while transforming into the adult beetle, which generally requires a month or more. The curculio thus produced then finds some sheltered place in which to pass the winter.

Injuries.

The amount of injury caused by the plum curculio during 1898 in Pennsylvania has already been stated, but as the cherry, peach, apricot and nectarine are also attacked by it, the loss by its ravages is in reality greater than has been indicated.

Treatment.

There are several insects which are the enemies of the curculio, either by feeding upon it in its different stages, or by their parasitic habits. Unfortunately these friends of the plum grower are rarely sufficiently abundant to be of much service and the use of various methods of treatment must be relied upon to insure a good crop.

Three methods are available for the destruction of this insect, no one of which is entirely effective but which in combination will greatly reduce the loss.

It has been stated that until the plums are large enough to lay their eggs in, the adult beetles feed upon the young leaves. Accordingly, just before the flowers open, the tree should be sprayed with Paris green or London purple. To prepare this mix one pound of the poison with a pound of fresh lime and add 150 gallons of water, using only enough of this at first to slake the lime, and afterwards adding the rest. After the blossoms have fallen, spray the tree again. Do not spray while the tree is in blossom. If peach trees are to be sprayed, 250 gallons of water should be used.

A second way of treating this insect is by placing a large white cloth under the tree at morning and evening and suddenly jarring the tree. At these times the beetles are sluggish and disinclined to fly, but drop on to the cloth, where they may be killed. Those who raise plums on a large scale find it advantageous to tack the cloth onto a frame sloping towards the centre, where there is a hole in which is fastened a can containing kerosene. A split on one side of the frame extending in to the center allows the frame to be pushed under the tree, the trunk passing through the slit, over which a cloth flap can then be turned to close it. Such a frame is mounted on wheels and run under the trees, and where large numbers of trees are treated, saves much time.

These two methods are for the destruction of the adult insect. To destroy the grub, it is advisable to gather all the imperfect plums twice a day, as they fall, and burn them, beginning about a week after spraying the second time. Poultry and hogs, if allowed to run under the trees, will also feed on the infested plums and destroy great numbers of them. These three methods used together, will enable the plum raiser to obtain a good crop of this delightful fruit.